Relations and Functions

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It is a well defined collection of objects.

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ORDERED PAIR

Ordered pair is a collection of elements that are separated by comma and written in parenthesis.

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Questions-1

If $(x+2,3y+4) = (25,2)$ then x and y are

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Cartesian Product

If A and B are two non-empty sets , then cartesian product of A and B is denoted by

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Relations

A relation R from non-empty set A to non-empty set B is the subset of cartesian product of A and B.

The subset is derived by describing a relationship between the first and second elements of ordered pairs.

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Questions-2

The relation R on the set A $=\{1,2,3,4, \ldots, 14\}$ defined as R$= \{(x, y): x, y \epsilon A, 3x - y = 0\}$

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Domain of Relation

The Set of all the first elements in a relation R from a set A to set B is called Domain of the relation R.

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Questions-2

If R=$\{(x, y): x, y \in Z, x^2 + y^2 \leq 4\}$ is a relation is set Z then domain of R is

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Codomain and Range of Relation

The set of all the second elements in a relation R from a set A to Set B is called the range of the relation R.

The whole set B is called codomain of the relation R.

Range is the subset of codomain.

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Questions-2

Let A =$\{1,2,3,4,5,6\}$ & B= $\{4,7,10\}$. Define a relation R from A to B by
R=$\{(x,y): y = 3x + 1, where\ x \in A\ \&\ y \in B\}$.
Write down the domain,codomain & Range

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No of Relations

Let A & B be two sets having m &n elements respectively then no possible relations from set A to set B is 2^{mn}.

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If A is the set of even natural numbers less than 12 and B is the set of prime numbers less than 17 , then the number of relations from A to B is

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Inverse Relation

Let R be a relation from A to B then R^{-1} From B to A is defined as the inverse of R i.e
$R^{-1} = \{(y, x): (x, y) \in R\} \subseteq B \times A$

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Questions-2

If R is relation from $\{11,12,13\}$ to $\{8,10,12\}$ defined by y=x-3 then R^{-1} is

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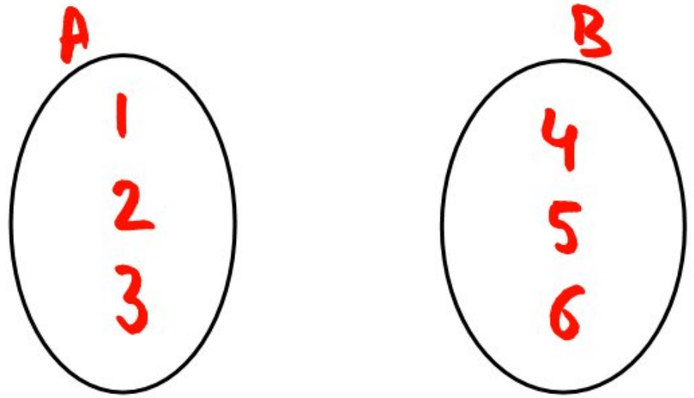
Types of Relations on a Set

1.Null or Empty or void Relation:- Let A be a non-empty set. The empty set ϕ is a subset of $A \times A$, this Relation in A is called void.

$A = \{1,2,3\}$ $B = \{4,5,6\}$.

$R = \{(x,y) : x > y \quad x \in A, y \in B\}$

$R = \{\} = \phi$



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Identity Relation

The relation R = $\{(a, a); for\ all\ a \in A\}$ is called the identity relation on A note that in identity relation every elements is related to itself only.

$A = \{1, 2, 3\}$

$R = \{(1,1), (2,2), (3,3)\}$

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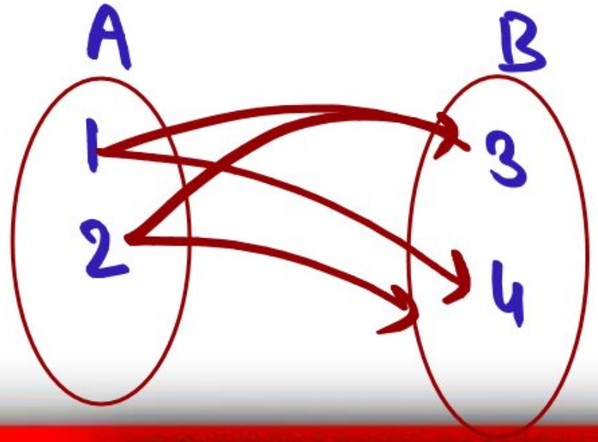
Universal Relation

$$A \times B = R$$

$A = \{1, 2\}$ $B = \{3, 4\}$

$R = \{(x, y) : x < y \quad x \in A, y \in B\}$

$R = \{(1,3)(1,4)(2,3)(2,4)\}$



$A \times B = \{(1,3)\ (1,4)\ (2,3)(2,4)\}$

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Reflexive Relation

A relation in R is called reflexive if each element of set is related to itself

$R=\{(x,x): x \in A\}$

$A = \{1,2,3,4\}$

$R = \{(1,1)(2,2)(3,3)(4,4)\}$ — Reflexive Relation.

Identity Relation.

$R = \{(1,1)(2,2)(3,3)(4,4)(1,2)(2,4)\}$ — Reflexive Relation

∴ Identity Relation

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No of Reflexive Relation

No of Reflexive Relation $= 2^{n^2-n}$

If $A=\{1,3\}$ Find No of Reflexive Relation.

$n(A)=2$

No of Reflexive Relation $= 2^{(2)^2-2} = 2^{4-2} = 2^2 = 4$

Ans

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Symmetric Relation

A relation is said to be symmetric if (x,y)$\in R$ $then$ $(y,x) \in R$.

$A = \{1,2,3,4\}$

$R = \{(1,2),(2,1),(1,3),(3,1),(1,4)(4,1)\}$

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Number of symmetric Relation

No of Symmetric Relation $= 2^{\frac{n(n+1)}{2}}$

If $A = \{a, b, c, d\}$

$n(A) = 4$

No of Symmetric Relation $= 2^{\frac{4(4+1)}{2}} = 2^{\frac{4(5)}{2}} = 2^{2\times 5} = 2^{10}$

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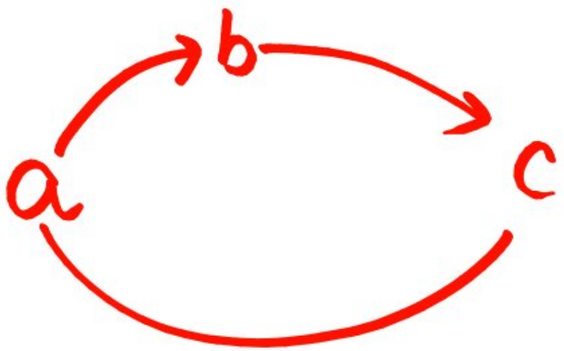
Transitive Relation

A relation R on a given non-empty set A is said to be transitive if
$(a,b) \in R$ & $(b,c) \in R$ then
$(a,c) \in R$ where $a, b, c \in A$

$R = \{(a,b)\ (b,d)\ (a,d)\}$



Relation.

$R = \{(1,2)\ (2,3)\ (3,4)\ (1,3)\}$

$(1,2) \in R$ & $(2,3) \in R$

then $(1,3) \in R$

$(2,3) \in R$, $(3,4) \in R$

then $(2,4) \notin R$

It is not trans. Relation.

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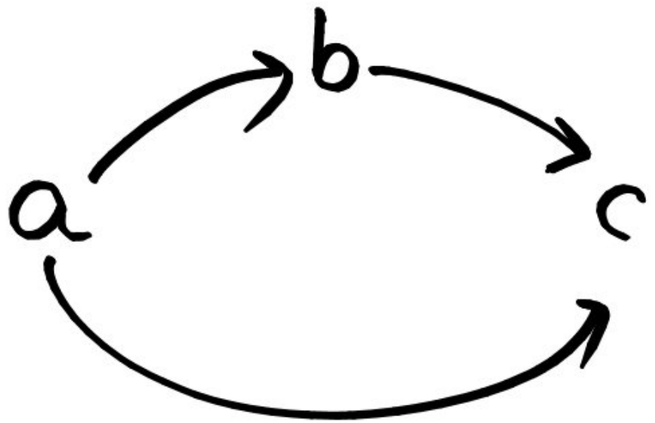
$R = \{(1,2)(3,4)(5,6)\}$

~~Hogo~~



$R = \{(a,b)(b,c)(a,c)\}$

$R = \{(a,b)\ (c,d)(m,n)\}$

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